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Paired Minimum Temperatures As Indices of Fair or Foul Weather

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In April, 1933, the attention of Region One Forest officers was called to a simple method of determining the possibility of unsettled weather, including lightning storms. This method is not infallible and best results are obtained only during July and August, yet any simple process that assists in estimating either the possibility of lightning or the probability of fair weather can be used in this Region to get better forest fire control at less cost.

The present method is based on the principle that warm air rises into a colder layer above it, thereby creating what is called a convectional storm. Such a flow of air always increases the wind velocity, and if the warm air has a high moisture content this moisture is condensed when it reaches the colder layer aloft, thereby forming clouds which may, if sufficiently turbulent, generate lightning and/or precipitation. A study of weather records for pairs of adjacent stations at high and low elevations, such as a lookout station and a ranger station not more than 10 or 12 miles away, showed that the minimum temperatures at these pairs of stations can be used dependably to indicate the probability of fair or foul weather each day. This study showed the best dependability for July and August, but forecasts based on comparisons of minimum temperatures during June, 1934, have also been quite accurate, as shown.

The method of comparing these minimum temperatures is indicated by the tabulation of the records for Elk Mountain Lookout (elevation 5348) and Bungalow Ranger Station (elevation 2250) on the Clearwater National Forest. As shown in this tabulation, when the minimum at the lookout is lower than the minimum at the ranger station, unsettled weather is indicated. When the ranger station has the lower minimum, fair weather is most likely to occur in that vicinity that day.

Sample of Forecasts Based on Paired Minimum Temperatures

Date	Minimum Temperature in Morning		Difference	Forecasts Based on Difference°	Actual Weather
	Elk Mtn.	Bungalow			
1	35	46	-	Unsettled	Rain
2	34	40	-	"	"
3	42	49	-	"	Thunderstorms
4	39	49	-	"	Unsettled
5	41	40	+	Fair	Thunderstorms
6	43	46	-	Unsettled	Rain
7	42	49	-	"	"
8	40	48	-	"	"
9	48	49	-	"	Fair
10	54	49	+	Fair	"
11	57	50	+	"	"
12	60	58	+	"	"
13	55	49	+	"	"
14	53	46	+	"	"
15	50	46	+	"	"
16	45	42	+	"	"
17	48	43	+	"	"
18	49	52	-	Unsettled	Unsettled
19	41	42	-	"	Fair
20	43	42	+	Fair	"

° + indicates fair, - indicates unsettled weather.

This record for early June contains 10 forecasts of unsettled weather, of which two are in error, thereby showing 80% dependability. Of the 10 forecasts of fair weather, only one was wrong, showing 90% dependability. This greater dependability in indicating fair weather was also found by the original investigation of the records for three pairs of stations. That investigation showed a dependability of 84% for unsettled forecasts, and 91½% for fair weather forecasts during July and August.

Standard minimum thermometers should be used for this work, each properly exposed either in a standard meteorological instrument shelter or in a well ventilated box that shields the thermometer from both rain and sunshine. The usual exposure of the instrument is about 4½ feet above the ground. The thermometers cost about $3.35 each when obtained through the Forest Service.